CLAIMS

We claim:

1. A receiver, comprising:

at least one one-dimensional receiver, each of the at least one one-dimensional receivers coupled to receive an input signal, at least one of the at least one one-dimensional receiver including a filter, analog-to-digital converter, and decision feedback equalizer coupled in series, the decision feedback equalizer including a look-up table in a feedback portion;

a multi-dimensional decoder coupled to receive an output signal from each of the at least one one-dimensional receiver, the multi-dimensional decoder outputting a stream of multi-dimensional symbols based on the output signals received from the at least one one-dimensional receiver.

2. The receiver of Claim 1, further including a coefficient update to adaptively chose equalizer parameters for the equalizer.

3. The receiver of Claim 1, further including an echo canceller circuit coupled in series with the filter, the analog-to-digital filter, and the equalizer.

4. The receiver of Claim 1, further including a NEXT canceller circuit coupled in series with the filter, the analog-to-digital filter, and the equalizer.

5. The receiver according to Claim 1, further including a baseline wander correction circuit coupled

in series with the filter, the analog-to-digital filter, and the equalizer.

6. The receiver according to Claim 1, wherein the filter includes an analog equalizor.

7. The receiver of Claim 1, further including an amplifier coupled in series with the filter, the analog-to-digital filter, and the equalizer.

8. The receiver of Claim 1, wherein the multidimensional decoder includes

at least one 1-D slicer, each of the at least one 1-D slicers coupled to receive an equalized signal from one of the at least one one-dimensional receivers, the 1-D slicer estimating a symbol and an error signal for the associated one-dimensional receiver;

an error correction circuit coupled to receive the error signals from each of the at least one 1-D slicer, the error correction outputting an error result indicating which of the at least one one-dimensional receivers is most likely to be incorrect;

a parity check circuit coupled to receive the symbol from each of the at least one 1-D slicer, the parity check circuit outputting a parity signal indicating whether the multi-dimensional symbol formed by the symbols from each of the at least one 1-D slicer is correct; and

a decoder coupled to receive the parity signal, the error result, and the symbols from each of the at least one 1-D slicer and outputting a multidimensional symbol formed from the symbols from each of the at least one 1-D slicer if the parity signal indicates no parity error and formed

from the symbols from each of the at least one 1-D slicer corrected by modifying the symbol associated with the receiver indicated by the error result if the parity signal indicates a parity error.

9. A receiver, comprising:

at least one one-dimensional receiver, each of the at least one one-dimensional receivers coupled to receive an input signal, each of the at least one one-dimensional receivers including a filter, analog-to-digital converter, and sequence detector;

a multi-dimensional decoder coupled to receive an output signal from each of the at least one one-dimensional receiver, the multi-dimensional decoder outputting a stream of multi-dimensional symbols based on the output signals received from the at least one one-dimensional receiver.

10. The receiver of Claim 9, wherein the at least one one-dimensional receiver further includes a pre-equalizer, the sequence detector being coupled to receive a pre-equalized signal from the pre-equalizer.

11. The receiver of Claim 9, wherein the sequence detector includes

a branch metric generator, the branch metric generator calculating a set of branch metrics based on an input signal to the branch metric generator;

an add-compare-select circuit, the add-compare-select circuit coupled to receive the set of branch metrics from the branch metric generator and calculating a set of state metrics and a set

of ACS results based on the set of branch metrics; and

a starting point determination circuit coupled to receive the set of state metrics and determine a starting point value based on the set of state metrics.

12. The receiver of Claim 11, wherein the branch metric generator is coupled to receive the set of ACS results from the add-compare-select circuit and calculates the set of branch metrics based on the input signal and the set of ACS results.

13. The receiver of Claim 11, wherein the branch metric generator is coupled through a look-up table to the add-compare select circuit and calculates the set of branch metrics based on the input signal and the set of ACS results.

14. The receiver of Claim 11, wherein the add-compare-select calculates a set of second choice ACS results and a set of differences based on the set of branch metrics.

15. The receiver of Claim 14, wherein the multidimensional decoder includes

at least one read block, each of the at least one read blocks coupled to one of the at least one receivers to receive the set of ACS results, the set of second choice ACS results, the set of differences, and the starting point value, each of the at least one read block determining a first symbol, a second symbol, and a reliability metric;

a parity check block coupled to receive the first symbol from each of the at least one read block and computing a parity signal;

an error analysis block coupled to receive the reliability metric from each of the at least one read block, the error analysis block generating an error indication signal indicating which of the first symbols of at least one read block is most likely not to be correct;

a decoder coupled to receive the first symbol and the second symbol from each of the at least one read block, the parity symbol from the parity check block, and the reliability metric from the error analysis block and determining a final set of symbols.

16. The receiver of Claim 15, wherein each of the at least one read block is coupled to receive a final result signal from the decoder, and wherein each of the at least one read block performs a traceback operation based on the set of ACS results, the set of second choice ACS results, the set of differences, and the final result signal.

17. The receiver of Claim 11, wherein the sequence detector is a reduced complexity sequence detector with state reduction.

18. The receiver of Claim 9, further including a coefficient update to adaptively chose equalizer parameters for the equalizer.

19. The receiver of Claim 9, further including an echo canceller circuit coupled in series with the filter, the analog-to-digital filter, and the equalizer.

20. The receiver of Claim 9, further including a NEXT canceller circuit coupled in series with the filter, the analog-to-digital filter, and the equalizer.

21. The receiver according to Claim 9, further including a baseline wander correction circuit coupled in series with the filter, the analog-to-digital filter, and the equalizer.

22. The receiver according to Claim 9, wherein the filter includes an analog equalizor.

23. The receiver of Claim 9, further including an amplifier coupled in series with the filter, the analog-to-digital filter, and the equalizer.

24. A method of detecting symbols transmitted over a plurality of channels, comprising:

receiving an input signal from each of the plurality of channels;

filtering the input signal from each of the plurality of channels to obtain a filtered signal for each of the plurality of channels;

digitizing the filtered signal from each of the plurality of channels to obtain a digitized signal for each of the plurality of channels;

equalizing the digitized signal with a decision feedback equalizer having a look-up table in at feedback loop from each of the plurality of channels to obtain an equalized signal from each of the plurality of channels;

determining a multidimensional symbol from the digitized symbols from each of the plurality of channels.

25. The method of Claim 24, wherein filtering includes echo cancellation.

26. The method of Claim 24, wherein filtering includes NEXT cancellation.

27. The method of Claim 24, wherein filtering includes baseline wander correction.

28. A method of detecting symbols transmitted over a plurality of channels, comprising:

receiving an input signal from each of the plurality of channels;

filtering the input signal from each of the plurality of channels to obtain a filtered signal for each of the plurality of channels;

digitizing the filtered signal from each of the plurality of channels to obtain a digitized signal for each of the plurality of channels;

equalizing the digitized signal with a sequence detector from each of the plurality of channels to obtain an equalized signal from each of the plurality of channels;

determining a multidimensional symbol from the digitized symbols from each of the plurality of channels.

29. The method of Claim 28, wherein filtering includes echo cancellation.

30. The method of Claim 28, wherein filtering includes NEXT cancellation.

31. The method of Claim 28, wherein filtering includes baseline wander correction.

32. The method of Claim 28, wherein equalizing the digitized signal includes:

computing a branch metric based on the digitized signal;

computing a set of ACS results and a set of state metrics based on the branch metric; and

computing a starting point based on the set of state metrics.

33. The method of Claim 32, wherein the branch metric and ACS results are based on state reduction.

34. The method of Claim 32, further including computing a second set of ACS results and a set of differences.

35. The method of Claim 34, wherein determining the multidimensional symbol includes

tracing back based on the ACS results and the starting point on each of the plurality of channels to compute a symbol for each of the plurality of channels;

determining which one of the plurality of channels is most likely to have an incorrect symbol;

forming a multidimensional symbol from the symbol for each of the plurality of channels;

determining a parity of the multidimensional symbol;

replacing the symbol from the one of the plurality of channels which is most likely to have an incorrect symbol in the multidimensional symbol based on the parity of the multidimensional symbol.